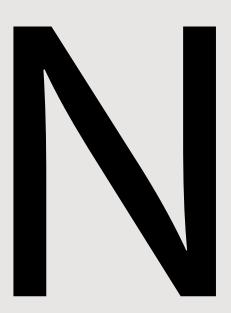# Picton Road upgrade between Nepean River and Almond Street, Wilton

Review of Environmental Factors

Appendix N

Operational air quality assessment data

N

This appendix provides a summary of the air quality monitoring station data used for the construction air quality impact assessment and the detailed modelling results for the operational air quality impact assessment. The results of the operational air quality assessment are summarised in section 6.9.

Background air quality

DPE has established a network of monitoring stations across NSW to understand current air quality conditions and impacts, and to help identify programs to improve air quality. The closest air quality monitoring stations to the proposal site are the:

- Bargo air quality monitoring station, located about 11 kilometres south-west of the proposal site

- Campbelltown West air quality monitoring station, located about 21 kilometres north-east of the proposal site

- Oakdale air quality monitoring station, located about 26 kilometres north-west of the proposal.

A summary of data from these air quality monitoring stations from the last five year period (2018 to 2022) is provided in Table M-1:

Table M-1: Summary of background air quality data from nearby DPE air quality monitoring stations

Pollutant	Averaging period	Recorded background concentration by year ($\mu g/m^3$)				
		2018	2019	2020	2021	2022
Bargo AQMS						
PM_{10}	24 hour maximum	60.8	188.9	265.7	63.9	25.4
	Maximum 24 hour below assessment criteria (50 µg/m3)	49.0	44.7	47.6	35.7	25.4
	90th percentile of 24 hour average data	28.0	36.1	25.2	18.9	15.2
	Annual average	16.9	21.2	15.9	11.8	9.9
	Number of days above assessment criteria (number of days > 50 µg/m3)	4	21	6	1	0
$PM_{2.5}$	24 hour maximum	38.1	170.7	121.9	65.3	11.8
	Maximum 24 hour below assessment criteria (20 µg/m3)	19.0	19.8	19.9	15.7	11.8
	90th percentile of 24 hour average data	10.6	16.0	11.1	7.8	6.1
	Annual average	6.8	10.4	7.8	5.3	3.7
	Number of days above assessment criteria (number of days > 20 µg/m3)	4	23	15	6	0
Nitrogen dioxide (NO_2)	1 hour	98.4	135.3	92.3	108.7	69.7
	Annual average	14.3	14.8	13.7	14.1	12.0
Carbon monoxide (CO)	1 hour	Not recorded				
	8 hours					

Review of Environmental Factors

Pollutant	Averaging period	Recorded background concentration by year (µg/m^3)				
		2018	2019	2020	2021	2022
Campbelltown West AQMS						
PM$_{10}$	24 hour maximum	72.3	132.0	249.7	111.9	30.2
	Maximum 24 hour below assessment criteria (50 µg/m3)	48.7	48.6	42.3	35.1	30.2
	90th percentile of 24 hour average data	28.7	37.4	27.4	20.0	16.1
	Annual average	17.9	22.3	17.0	13.8	11.3
	Number of days above assessment criteria (number of days > 50 µg/m3)	3	24	10	3	0
PM$_{2.5}$	24 hour maximum	45.4	106.0	69.0	99.9	23.2
	Maximum 24 hour below assessment criteria (20 µg/m3)	18.3	19.3	19.5	18.5	16.3
	90th percentile of 24 hour average data	13.6	21.2	13.0	9.1	7.5
	Annual average	8.4	11.8	7.5	6.3	4.6
	Number of days above assessment criteria (number of days > 20 µg/m3)	6	35	15	5	1
Nitrogen dioxide (NO$_2$)	1 hour	110.7	121.0	104.6	112.8	86.1
	Annual average	22.0	22.2	20.0	18.7	17.6
Carbon monoxide (CO)	1 hour	2,250	5,750	3,125	3,250	875
	8 hours	1,875	3,625	2,875	2,375	500
Oakdale AQMS						
PM$_{10}$	24 hour maximum	105.1	216.8	248.9	73.2	22.8
	Maximum 24 hour below assessment criteria (50 µg/m3)	43.0	47.0	49.9	28.4	22.8
	90th percentile of 24 hour average data	25.3	39.2	22.5	17.8	14.0
	Annual average	15.4	22.4	14.4	10.6	8.8
	Number of days above assessment criteria (number of days > 50 µg/m3)	5	28	10	1	0
PM$_{2.5}$	24 hour maximum	75.4	250.2	161.6	100.0	16.6
	Maximum 24 hour below assessment criteria (20 µg/m3)	19.9	19.9	17.7	16.9	16.6
	90th percentile of 24 hour average data	10.5	17.5	9.7	6.8	5.7
	Annual average	6.9	13.2	6.8	4.6	3.6
	Number of days above assessment criteria (number of days > 20 µg/m3)	3	30	14	1	0

Pollutant	Averaging period	Recorded background concentration by year ($\mu g/m^3$)				
		2018	2019	2020	2021	2022
Nitrogen dioxide (NO$_2$)	1 hour	59.5	57.4	112.8	139.4	24.6
	Annual average	4.6	5.3	4.3	4.1	3.8
Carbon monoxide (CO)	1 hour	Not recorded				
	8 hours					

Operational air quality assessment data

TRAQ modelling was undertaken for Picton Road and the M31 Hume Motorway, at the opening year (2031) and design year (2046) for both no-build and build scenarios. A total of eight scenarios were assessed:

- Picton Road:

    - Picton Road opening year no-build (2031)

    - Picton Road opening year build (2031)

    - Picton Road design year no-build (2046)

    - Picton Road design year build (2046).

- M31 Hume Motorway:

    - M31 Hume Motorway opening year no-build (2031)

    - M31 Hume Motorway opening year build (2031)

    - M31 Hume Motorway design year no-build (2046)

    - M31 Hume Motorway design year build (2046).

Traffic forecast data as described in the Traffic and Transport Impact Assessment (see Appendix D) and summarised in section 6.2 has been used to estimate vehicle emissions and to quantify air quality impacts attributed to operation of the proposal.

The modelling inputs for the assessment are provided in Table M-2.

Table M-2:   TRAQ model inputs

Scenario	Daily traffic volume (vehicles/day)	Number of lanes (total in both directions)
Picton Road opening year no-build (2031)	31,330	4
Picton Road opening year build (2031)	30,582	6
Picton Road design year no-build (2046)	41,594	4
Picton Road design year build (2046)	41,207	6
M31 Hume Motorway opening year no-build (2031)	50,375	4
M31 Hume Motorway opening year build (2031)	50,240	4
M31 Hume Motorway design year no-build (2046)	58,223	4
M31 Hume Motorway design year build (2046)	59,767	4

The following assumptions were considered as part of the modelling:

- A peak hour speed of 59 kilometres per hour (km/h) and a 24-hour vehicle weighted average speed of 66 km/h was assumed for all scenarios. These are the model default values for highway / freeway road types and are considered conservative as the current design suggests higher speeds are likely. Lower vehicle speeds typically result in higher emission rates and are considered worst case.

- Peak hour traffic volumes were estimated as 10 per cent of daily traffic volumes.

- A 50:50 directional split of traffic volumes was assumed.

- The traffic make-up for each scenario was based on the default values for a highway / freeway which assumes approximately 79 per cent light vehicles and 21 per cent heavy vehicles. Concept design vehicle forecasts estimate an approximate 85 to 15 per cent distribution of light vehicles to heavy vehicles. Therefore this assumption was considered conservative as emissions to air from heavy vehicles are greater than those from light vehicles.

- The TRAQ assessment tool uses the worst-case weather conditions occurring all year, which is considered a conservative approach.

- Due to modelling limitations, $PM_{2.5}$ was not individually modelled, instead a $PM_{2.5}/PM_{10}$ ratio of 0.5 was adopted to scale TRAQ predictions.

- The maximum number of lanes was modelled for each scenario.

The results of the modelling are provided in Tables M-3 and M-4 for Picton Road (opening year and design year, respectively) and Tables M-5 and M-6 for the M31 Hume Motorway (opening year and design year, respectively). To assess the potential air quality impacts at future sensitive receptor's locations, predicted pollutant concentrations were presented as a function of distance from the road kerb. The modelling predicted a minimum separation distance where air quality impacts could occur. If future sensitive receptors are located beyond the predicted minimum separation distance air quality impacts would not be expected.

Table M-3: Predicted pollutant concentration for proposal opening year (2031)

Receptor location	Predicted pollutant concentration (µg/m³)															
	Incremental								Cumulative							
Pollutant	CO		NO$_2$		PM$_{10}$		PM$_{2.5}$		CO		NO$_2$		PM$_{10}$		PM$_{2.5}$	
Averaging period	1 hour	8 hour	1 hour	Annual	24 hour	Annual	24 hour	Annual	1 hour	8 hour	1 hour	Annual	24 hour	Annual	24 hour	Annual
Criteria	30,000	10,000	164	31	50	25	20	7.0	30,000	10,000	164	31	50	25	20	7.0
No build																
10 m from kerb	200	100	21.1	4.2	8.0	3.2	4.0	1.6	3,450	2,475	129.8	18.3	26.9	15.0	11.8	6.9
20 m from kerb	100	100	21.0	4.2	6.0	2.4	3.0	1.2	3,350	2,475	129.7	18.3	24.9	14.2	10.8	6.5
30 m from kerb	100	100	17.5	3.5	5.0	2.0	2.5	1.0	3,350	2,475	126.2	17.6	23.9	13.8	10.3	6.3
40 m from kerb	100	100	15.3	3.1	4.3	1.7	2.2	0.9	3,350	2,475	124.0	17.2	23.2	13.5	10.0	6.1
50 m from kerb	100	100	13.7	2.7	3.9	1.6	2.0	0.8	3,350	2,475	122.4	16.8	22.8	13.4	9.8	6.1
75 m from kerb	100	0	11.2	2.2	3.2	1.3	1.6	0.7	3,350	2,375	119.9	16.3	22.1	13.1	9.4	5.9
100 m from kerb	100	0	9.5	1.9	2.7	1.1	1.4	0.6	3,350	2,375	118.2	16.0	21.6	12.9	9.2	5.8
150 m from kerb	0	0	7.5	1.5	2.1	0.8	1.1	0.4	3,250	2,375	116.2	15.6	21.0	12.6	8.9	5.7
200 m from kerb	0	0	6.2	1.2	1.8	0.7	0.9	0.4	3,250	2,375	114.9	15.3	20.7	12.5	8.7	5.6
Build																
10 m from kerb	100	100	19.7	3.9	7.4	3.0	2.9	1.2	3,350	2,475	129.1	18.2	24.7	14.1	10.7	6.4
20 m from kerb	100	100	20.4	4.1	5.8	2.3	2.5	1.0	3,350	2,475	125.9	17.5	23.8	13.8	10.3	6.3
30 m from kerb	100	100	17.2	3.4	4.9	2.0	2.2	0.9	3,350	2,475	123.9	17.1	23.2	13.5	10.0	6.1
40 m from kerb	100	100	15.2	3.0	4.3	1.7	2.0	0.8	3,350	2,475	122.4	16.8	22.8	13.4	9.8	6.1
50 m from kerb	100	100	13.7	2.7	3.9	1.6	1.6	0.7	3,350	2,375	119.9	16.3	22.1	13.1	9.4	5.9
75 m from kerb	100	0	11.2	2.2	3.2	1.3	1.6	0.7	3,350	2,375	119.9	16.3	22.1	13.1	9.4	5.9
100 m from kerb	100	0	9.6	1.9	2.7	1.1	1.4	0.6	3,350	2,375	118.3	16.0	21.6	12.9	9.2	5.8
150 m from kerb	0	0	7.6	1.5	2.1	0.9	1.1	0.5	3,250	2,375	116.3	15.6	21.0	12.7	8.9	5.7
200 m from kerb	0	0	6.3	1.3	1.8	0.7	0.9	0.4	3,250	2,375	115.0	15.4	20.7	12.5	8.7	5.6

Table M-4: Predicted pollutant concentration for Picton Road-Design year (2046)

Receptor location	Predicted pollutant concentration (µg/m³)															
	Incremental								Cumulative							
Pollutant	CO		NO₂		PM₁₀		PM₂.₅		CO		NO₂		PM₁₀		PM₂.₅	
Averaging period	1 hour	8 hour	1 hour	Annual	24 hour	Annual	24 hour	Annual	1 hour	8 hour	1 hour	Annual	24 hour	Annual	24 hour	Annual
Criteria	30,000	10,000	164	31	50	25	20	7.0	30,000	10,000	164	31	50	25	20	7.0
No build																
10 m from kerb	200	100	25.1	5.0	9.9	4.0	5.0	2.0	3,450	2,475	133.8	19.1	28.8	15.8	12.8	7.3
20 m from kerb	100	100	24.9	5.0	7.4	2.9	3.7	1.5	3,350	2,475	133.6	19.1	26.3	14.7	11.5	6.7
30 m from kerb	100	100	20.8	4.2	6.2	2.5	3.1	1.3	3,350	2,475	129.5	18.3	25.1	14.3	10.9	6.5
40 m from kerb	100	100	18.3	3.7	5.4	2.2	2.7	1.1	3,350	2,475	127.0	17.8	24.3	14.0	10.5	6.4
50 m from kerb	100	100	16.4	3.3	4.9	1.9	2.5	1.0	3,350	2,475	125.1	17.4	23.8	13.7	10.3	6.2
75 m from kerb	100	100	13.4	2.7	4.0	1.6	2.0	0.8	3,350	2,475	122.1	16.8	22.9	13.4	9.8	6.1
100 m from kerb	100	0	11.4	2.3	3.4	1.4	1.7	0.7	3,350	2,375	120.1	16.4	22.3	13.2	9.5	6.0
150 m from kerb	100	0	9.0	1.8	2.7	1.1	1.4	0.6	3,350	2,375	117.7	15.9	21.6	12.9	9.2	5.8
200 m from kerb	0	0	7.6	1.5	2.2	0.9	1.1	0.5	3,250	2,375	116.3	15.6	21.1	12.7	8.9	5.7
Build																
10 m from kerb	200	100	24.1	4.8	9.5	3.8	4.8	1.9	3,450	2,475	132.8	18.9	28.4	15.6	12.6	7.2
20 m from kerb	100	100	24.9	5.0	7.4	2.9	3.7	1.5	3,350	2,475	133.6	19.1	26.3	14.7	11.5	6.7
30 m from kerb	100	100	21.1	4.2	6.2	2.5	3.1	1.3	3,350	2,475	129.8	18.3	25.1	14.3	10.9	6.5
40 m from kerb	100	100	18.6	3.7	5.5	2.2	2.8	1.1	3,350	2,475	127.3	17.8	24.4	14.0	10.6	6.4
50 m from kerb	100	100	16.8	3.4	5.0	2.0	2.5	1.0	3,350	2,475	125.5	17.5	23.9	13.8	10.3	6.3
75 m from kerb	100	100	13.8	2.8	4.1	1.6	2.1	0.8	3,350	2,475	122.5	16.9	23.0	13.4	9.9	6.1
100 m from kerb	100	0	11.8	2.4	3.5	1.4	1.8	0.7	3,350	2,375	120.5	16.5	22.4	13.2	9.6	6.0
150 m from kerb	100	0	9.3	1.9	2.8	1.1	1.4	0.6	3,350	2,375	118.0	16.0	21.7	12.9	9.2	5.8
200 m from kerb	0	0	7.8	1.6	2.3	0.9	1.2	0.5	3,250	2,375	116.5	15.7	21.2	12.7	9.0	5.7

Table M-5: Predicted pollutant concentration for M31 Hume Motorway-Opening year (2031)

Receptor location	Predicted pollutant concentration (µg/m³)															
	Incremental								Cumulative							
Pollutant	CO		NO_2		PM_{10}		$PM_{2.5}$		CO		NO_2		PM_{10}		$PM_{2.5}$	
Averaging period	1 hour	8 hour	1 hour	Annual	24 hour	Annual	24 hour	Annual	1 hour	8 hour	1 hour	Annual	24 hour	Annual	24 hour	Annual
Criteria	30,000	10,000	164	31	50	25	20	7.0	30,000	10,000	164	31	50	25	20	7.0
No build																
10 m from kerb	200	100	27	6	10	4.1	5.2	2.1	3,450	2,475	136	20	29	15.9	13.0	7.3
20 m from kerb	200	100	28	6	8	3.1	3.9	1.6	3,450	2,475	136	20	27	14.9	11.7	6.8
30 m from kerb	100	100	23	5	7	2.7	3.3	1.4	3,350	2,475	132	19	26	14.5	11.1	6.6
40 m from kerb	100	100	21	4	6	2.4	3.0	1.2	3,350	2,475	129	18	25	14.2	10.8	6.5
50 m from kerb	100	100	19	4	5	2.1	2.7	1.1	3,350	2,475	128	18	24	13.9	10.5	6.3
75 m from kerb	100	100	16	3	5	1.8	2.3	0.9	3,350	2,475	124	17	23	13.6	10.1	6.2
100 m from kerb	100	100	14	3	4	1.5	2.0	0.8	3,350	2,475	122	17	23	13.3	9.8	6.0
150 m from kerb	100	-	11	2	3	1.2	1.6	0.6	3,350	2,375	120	16	22	13.0	9.4	5.9
200 m from kerb	100	-	9	2	3	1.0	1.3	0.5	3,350	2,375	118	16	22	12.8	9.1	5.8
Build																
10 m from kerb	200	100	27	5	10	4	5.2	2.1	3,450	2,475	136	19	29	15.9	13.0	7.3
20 m from kerb	200	100	28	6	8	3	3.9	1.6	3,450	2,475	136	20	27	14.9	11.7	6.8
30 m from kerb	100	100	23	5	7	3	3.3	1.3	3,350	2,475	132	19	26	14.4	11.1	6.6
40 m from kerb	100	100	21	4	6	2	3.0	1.2	3,350	2,475	129	18	25	14.1	10.8	6.4
50 m from kerb	100	100	19	4	5	2	2.7	1.1	3,350	2,475	128	18	24	13.9	10.5	6.3
75 m from kerb	100	100	16	3	4	2	2.2	0.9	3,350	2,475	124	17	23	13.6	10.0	6.2
100 m from kerb	100	100	14	3	4	2	1.9	0.8	3,350	2,475	122	17	23	13.3	9.7	6.0
150 m from kerb	100	-	11	2	3	1	1.6	0.6	3,350	2,375	119	16	22	13.0	9.4	5.9
200 m from kerb	100	-	9	2	3	1	1.3	0.5	3,350	2,375	118	16	22	12.8	9.1	5.8

Table M-6: Predicted pollutant concentration for M31 Hume Motorway-Design year (2046)

Receptor location	Predicted pollutant concentration (µg/m³)															
	Incremental								Cumulative							
Pollutant	CO		NO$_2$		PM$_{10}$		PM$_{2.5}$		CO		NO$_2$		PM$_{10}$		PM$_{2.5}$	
Averaging period	1 hour	8 hour	1 hour	Annual	24 hour	Annual	24 hour	Annual	1 hour	8 hour	1 hour	Annual	24 hour	Annual	24 hour	Annual
Criteria	30,000	10,000	164	31	50	25	20	7.0	30,000	10,000	164	31	50	25	20	7.0
No build																
10 m from kerb	200	200	28	6	11	4.5	5.6	2.3	3,450	2,575	137	20	30	16.3	13.4	7.5
20 m from kerb	200	100	29	6	9	3.4	4.3	1.7	3,450	2,475	137	20	27	15.2	12.1	7.0
30 m from kerb	100	100	24	5	7	2.9	3.6	1.5	3,350	2,475	133	19	26	14.7	11.4	6.7
40 m from kerb	100	100	22	4	6	2.6	3.2	1.3	3,350	2,475	130	18	25	14.4	11.0	6.6
50 m from kerb	100	100	20	4	6	2.3	2.9	1.2	3,350	2,475	128	18	25	14.1	10.7	6.4
75 m from kerb	100	100	16	3	5	1.9	2.5	1.0	3,350	2,475	125	17	24	13.7	10.3	6.2
100 m from kerb	100	100	14	3	4	1.7	2.1	0.9	3,350	2,475	123	17	23	13.5	9.9	6.1
150 m from kerb	100	-	12	2	3	1.4	1.7	0.7	3,350	2,375	120	16	22	13.2	9.5	6.0
200 m from kerb	100	-	10	2	3	1.1	1.5	0.6	3,350	2,375	118	16	22	12.9	9.3	5.8
Build																
10 m from kerb	200	200	29	6	11	4.6	5.7	2.3	3,450	2,575	138	20	30	16.4	13.5	7.6
20 m from kerb	200	100	29	6	9	3.5	4.4	1.8	3,450	2,475	138	20	28	15.3	12.2	7.0
30 m from kerb	100	100	25	5	7	2.9	3.7	1.5	3,350	2,475	133	19	26	14.7	11.5	6.7
40 m from kerb	100	100	22	4	7	2.6	3.3	1.3	3,350	2,475	131	18	25	14.4	11.1	6.6
50 m from kerb	100	100	20	4	6	2.4	3.0	1.2	3,350	2,475	129	18	25	14.2	10.8	6.5
75 m from kerb	100	100	17	3	5	2.0	2.5	1.0	3,350	2,475	125	17	24	13.8	10.3	6.3
100 m from kerb	100	100	15	3	4	1.7	2.2	0.9	3,350	2,475	123	17	23	13.5	10.0	6.1
150 m from kerb	100	-	12	2	4	1.4	1.8	0.7	3,350	2,375	120	16	22	13.2	9.6	6.0
200 m from kerb	100	-	10	2	3	1.2	1.5	0.6	3,350	2,375	118	16	22	13.0	9.3	5.9

Review of Environmental Factors